



Case Report

Surgical treatment of acquired esotropia in patients with high myopia

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Abstract

Acquired esotropia with high myopia may be associated with superotemporal eyeball prolapse from the muscle cone and the subsequent shift of extraocular muscles limits the success of the traditional recession–resection surgery. In this study, we report two patients diagnosed with myopic strabismus fixus with esodeviation >90 prism diopter. Marked axial elongation of globes was present in both the patients. They received medial rectus muscle recession and hemi-Jensen procedure in both eyes. Postoperatively, they showed significant improvement in abduction, elevation, and ocular alignment. We found that the combination of medial rectus muscle recession and hemi-Jensen procedure was effective in treating patients with acquired large esotropia with high myopia.

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1. Introduction

Strabismus fixus is a rare ocular motor abnormality in which one or both eyes are anchored in an extreme adduction or abduction position. Both congenital and acquired forms have been reported previously. The congenital forms may be variants of congenital fibrosis syndrome. A special form of acquired esotropic strabismus fixus is associated with high myopia.^{1,2} Its etiology was uncertain and has been discussed in the literature. However, the most recent explanation was provided by Aoki et al, who noted that the enlarged globe in high myopia herniated superotemporally and retro-equatorially through the muscle cone.³ The superotemporal eyeball prolapsed from the muscle cone and the subsequent shift of extraocular muscles limited the success of the traditional recession–resection surgery.⁴ Here, we report two such cases treated with a combination of hemi-Jensen procedure and large recession of the medial rectus (MR) muscle with favorable outcome.

2. Case reports*2.1. Case 1*

A 68-year-old woman with a history of high myopia in both eyes since childhood presented with progressive esotropia for several years. She neither had a history of trauma nor prior ocular surgery (but for bilateral lens extraction) for years. When examined using a Snellen E chart, her best-corrected visual acuity reading was 6/60 in the right eye and 6/30 in the left eye. She received lens retraction of both eyes and were aphakic; and her refraction status was $-0.75-1.75 \times 85^\circ$ in the right eye and $-3.75-1.5 \times 80^\circ$ in the left eye. The axial lengths measured 29.4 mm in the right eye and 28.5 mm in the left. Evaluation of ocular motility revealed marked limitation on abduction (-3°) of both eyes and an inability to reach midline (Fig. 1). Fundus examination revealed bilateral myopic chorioretinal degeneration. The anterior chamber and intraocular pressure in both eyes were normal. A forced duction test revealed severe restriction in both eyes.

Strabismus surgery in the right eye was performed under general anesthesia, and 3 months later the surgery was performed on the left eye as well. The surgical technique was as follows (Fig. 2):

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Fig. 1. Preoperative appearance in primary position, with both eyes fixed in extreme adduction.

1. The superior rectus (SR) and lateral rectus (LR) muscles were identified through limbal incision.
2. The superior half of the LR muscle and the temporal half of the SR muscle were divided and separated.
3. The hemimuscle bellies were looped and tied together by 5-0 Dacron nonabsorbable suture. The loop was tied at about 14 mm away from the limbus.
4. The MR muscle was recessed 8.0 mm using a hang-back suture. A traction suture was used to pull the lateral limbus to the lateral canthus at the end of surgery, and was removed on the following day. Postoperatively, the patient had much improvement in her ocular motility and alignment, but residual esotropia in the primary position measuring 10 prism diopter was still noted (Fig. 3). The patient was not aware of diplopia postoperatively, and there was no complication.

2.2. Case 2

A 47-year-old woman noted progressive esotropia for several years. She neither had trauma nor previous ocular surgery. When examined using a Snellen E chart, her best-corrected visual acuity reading was 6/30 OD and 6/60 OS. The refraction was -24.0 diopter in the right eye and was unmeasurable in the left eye. The axial lengths were 31.1 and

31.4 mm in the right and left eyes, respectively. Evaluation of ocular motility revealed severe limitation on abduction (-3) and inability to reach midline (Fig. 4). Dilated funduscopy showed myopic chorioretinal degeneration in both eyes. Observation of the anterior segment was unremarkable but for cortical opacity of the lens. The intraocular pressures in both eyes were normal.

The patient was treated using hemi-Jensen procedure of the SR and LR muscles. Additionally, the MR muscle was recessed 8.5 mm and then lateral traction sutures were separately performed in the right and left eyes, with the patient under general anesthetic conditions. Motility improved postoperatively. After 10 months' follow up, the patient had a 4-prism diopter esotropia in the primary position and no diplopia in the major position of gaze (Fig. 5).

3. Discussion

The correction of this misalignment is not always successful by traditional recession–resection surgery, and a good surgical result is achieved by repositioning the eyes in the primary position. Several surgical methods to stabilize the globe in high myopia have been described, including the recession–resection procedure and large recession of the MR muscle, complete disinsertion of the MR, lateral rotation of the eye using scleral stay sutures, and the Jensen procedure. Unfortunately, these procedures have been shown to have limited success, especially in advanced cases. Hayashi et al found that the traditional recession and resection surgery may be effective only in early stages for such patients.²

Acquired esotropia with high myopia may have the pathophysiology that the axial elongation of eyeball causes superotemporal eyeball prolapse from the muscle cone, as described by Krzizok and Yoshiko et al.^{3–5} High-resolution magnetic resonance imaging (MRI) has demonstrated the inferolateral displacement of the LR muscle and nasal displacement of the SR muscle in this restrictive motility disorder. They compared the eyeball and extraocular muscles' shape and position before and after surgery using magnetic resonance imaging, and concluded that weakening in the temporal upper aspect of the Tenon's capsule and intermuscular septum caused the globe to herniate out of the muscle cone. Restoration of the intermuscular connection is important to prevent further herniation.

This led to the consideration of other transposition procedures. Yokoyama et al performed loop myopexy of the LR and SR muscles to treat patients who had progressive esotropia with high myopia.⁶ Yamada et al performed hemitransposition of the LR and SR combined with a large recession of the MR muscle.⁷ Later, Larsen treated patients with highly myopic-acquired esotropia using hemi-Jensen procedure of the SR and LR muscles without MR muscle recession.⁸ Their results were effective and practical. Such surgeries may re-establish the physiological muscle plane. The previous articles also mentioned that the combination of hemi-Jensen procedure and MR muscle recession was useful and required in patients with severe limitation of abduction.² Unfortunately, Larsen did not

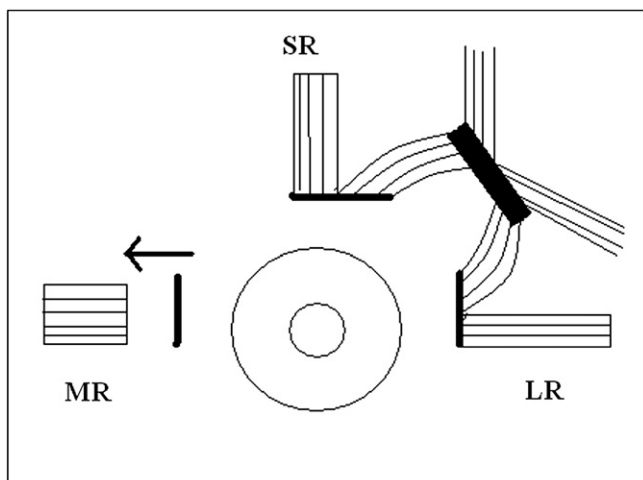


Fig. 2. Surgical procedures: MR recession + hemi-Jensen's procedure. LR = lateral rectus muscle; MR = medial rectus muscle; SR = superior rectus muscle.

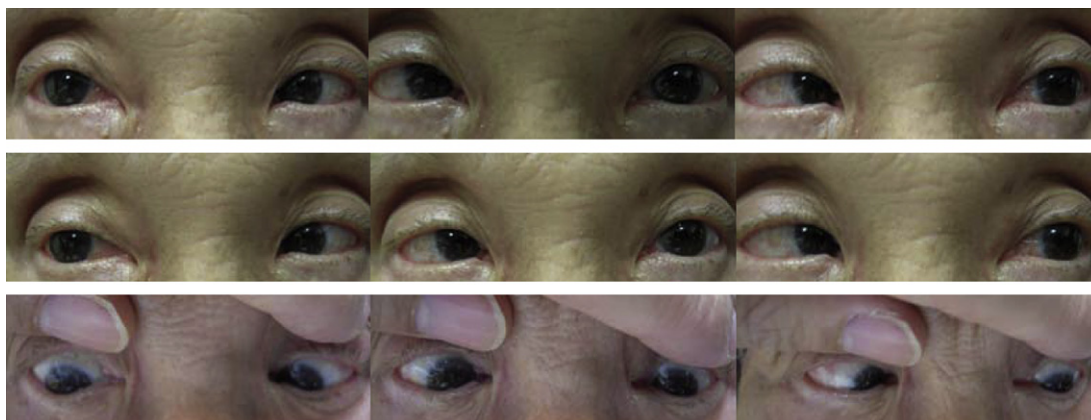


Fig. 3. Postoperative appearance showing nine positions of ocular motility.



Fig. 4. Preoperative appearance in primary position and severe esotropia with limited adduction.

mention the surgical indication as to the severity of esotropia; other authors suggested that the traditional recession–resection surgery might be successful only in the small-angle esotropic patients.²

Loop myopexy of the LR and SR without muscle splitting was first reported by Yokoyama et al,⁶ and then Wong and Basmak also used the loop myopexy without muscle splitting in cases of myopic strabismus fixus.^{9,10} Although their surgical results proved effective in most cases, there were some patients with residual esotropia (10Δ ET) and some patients with consecutive exotropia (14Δ XT) postoperatively.⁹ The surgery changed the SR and LR's muscle position and redirected their motility's plane, thus there were considerable limitations in abduction and elevation postoperatively. If the

loop was anchored to the sclera, the risk of scleral perforation existed. Recent studies suggested using the hemi-Jensen procedure with or without MR recession in such cases. Ahadzadeghan et al performed similar procedures in six patients, and there was also some residual esotropia postoperatively.¹¹ The hemi-Jensen procedure, compared with loop myopexy, preserves the unsecured halves of the SR and LR muscles, which may contribute to the circulation of the anterior segment. Thus, we consider the hemi-Jensen procedure to have a lower risk of ocular ischemic syndrome than loop myopexy.

We have reported two such cases treated with hemi-Jensen procedure and large recession of the MR muscle with favorable outcome. The surgery significantly improved ocular motility on abduction and elevation, and improved ocular alignment as well. There were no obvious complications during surgery or during follow up. Neither of the cases showed ocular ischemic syndrome postoperatively. The benefit of the combined procedure was the elimination of the risk of scleral perforation, as no suture was placed on the sclera. One possible complication was anterior segment ischemic syndrome, which did not occur in our cases nor was previously reported. Sophisticated surgical technique is needed to avoid the sacrifice of arterial circulation.

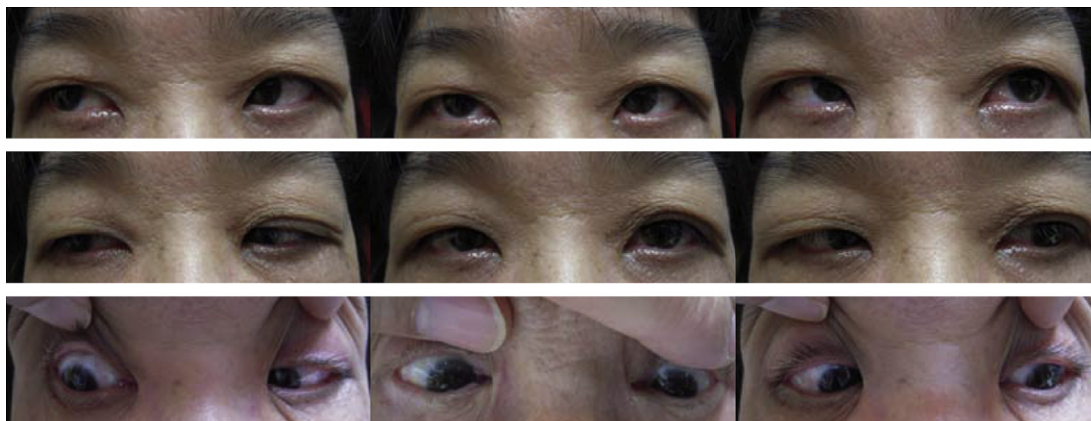


Fig. 5. The postoperative appearance in nine directions of ocular motility.

Therefore, we conclude that combined MR muscle recession and hemi-Jensen procedure is effective for treating strabismus fixus with high myopia. In very severe cases, adjustable suturing of the MR muscle may yield even better results.

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